Ed. I

The Norwood School Science Faculty

Retrieval Practice | Physics Paper 2

Quiz Questions | Edexcel

Science involves the recall and application of a lot of information.

You will not get a good grade unless you can remember this information.

This booklet will help you form and keep this information in your brain.

Regularly test yourself!

What this book won't do:

It is also very important that you are able to apply knowledge to new situations. This book will not help you do this well. You should ask your teacher for practice exam-style questions once you are confident with the content in this book.

Edexcel 9-1 Quiz Questions

Physics

Paper 2

Topic 1 – Key concepts of physics
Topic 8 – Energy – Forces doing work
Topic 9 – Forces and their effects
Topic 10 – Electricity and circuits
Topic 11 – Static electricity (separate physics only)
Topic 12 – Magnetism and the motor effect
Topic 13 – Electromagnetic induction
Topic 14 – Particle model
Topic 15 – Forces and matter

Topic 1 - Key Concepts in Physics

1. State the SI base unit for distance. Give it’s name and symbol.

2. State the SI base unit for mass. Give it’s name and symbol.

3. State the SI base unit for time. Give it’s name and symbol.

4. State the SI base unit for electric current. Give it’s name and symbol.

5. State the SI base unit for thermodynamic temperature. Give it’s name and symbol.

6. State the SI base unit for amount of substance. Give it’s name and symbol.

7. State the SI unit for frequency. Give it’s name and symbol.

8. State the SI unit for force. Give it’s name and symbol.

9. State the SI unit for energy. Give it’s name and symbol.

10. 10. State the SI unit for power. Give it’s name and symbol.

11. State the SI unit for pressure. Give it’s name and symbol.

12. State the SI unit for electric charge. Give it’s name and symbol.

13. State the SI unit for electric potential difference. Give it’s name and symbol.

14. State the SI unit for electric resistance. Give it’s name and symbol.

15. State the SI unit for magnetic flux density. Give it’s name and symbol.

16. What does the multiple ‘giga, G’ mean if it is found in front of a unit (for example, gigahertz)

17. What does the multiple ‘mega, M’ mean if it is found in front of a unit (for example, megahertz)?

18. What does the multiple ‘kilo, k’ mean if it is found in front of a unit (for example, kilohertz)?

19. What does the sub-multiple ‘centi, c’ mean if it is found in front of an SI unit (for example, centimetre)?

20. What does the sub- multiple ‘milli, m’ mean if it is found in front of an SI unit (for example, millimetre)?

21. What does the sub- multiple ‘micro, μ’ mean if it is found in front of an SI unit (for example, micrometre)?

22. What does the multiple ‘nano, n’ mean if it is found in front of an SI unit (for example, nanometre)?

23. How do you convert time from hours to seconds?

24. How do you convert time from seconds to hours?

25. Write the following numbers to 2 significant figures:
34.2
4.16
0.00572
4510

26. Write the following numbers in standard form:
57,890
0.0034
23
4,000,000

Topic 8 – Energy – Forces Doing Work

1. Identify eight types of energy store
2. Identify four types of energy transfer
3. What can be said about the net change of energy in a closed system if energy transfers take place within it?
4. Identify three different ways in which the energy of a system can be changed
5. Give an example of energy being transferred by heating
6. Give an example of energy being transferred by forces doing work
7. Give an example of energy being transferred by electrical equipment
8. Energy transfer is measured using which unit?
9. Work done is measured using which unit?
10. Write an equation to show the relationship between energy transferred and work done.
11. Describe how to measure the work done by a force
12. Recall the equation, with units, that links force, distance and work done.
13. Recall the equation, with units, for calculating a change in gravitational potential energy.
14. Recall the equation, with units, for calculating kinetic energy.
15. In all systems energy is **dissipated.** Explain what this means.
16. Explain why mechanical processes become wasteful.
17. Define the term **power.**
18. Recall the equation, with units, that links work done, time taken and power.
19. One watt is equal to what?
20. Recall the equation for calculating efficiency

Topic 9 – Forces and their effects

1. Name three types of fields that can act at distance on an object (these are known as non-contact forces).

2. Name two types of forces that act by contact

3. Explain the term **interaction pair**.

4. Explain the difference between vector and scalar quantities

5. *[H] Identify the features of a free body force diagram*

6. *[H] Describe what is meant by the term 'net force' on a free body diagram*

7. *[H] If an object is described as in* ***equilibrium****, what does this mean?*

8. Explain how unwanted energy transfers can be reduced through lubrication.

****** If you are studying the higher tier then you will also need to know how to draw free body diagrams and resolve a force. Your teacher should give you extra practice on this ******

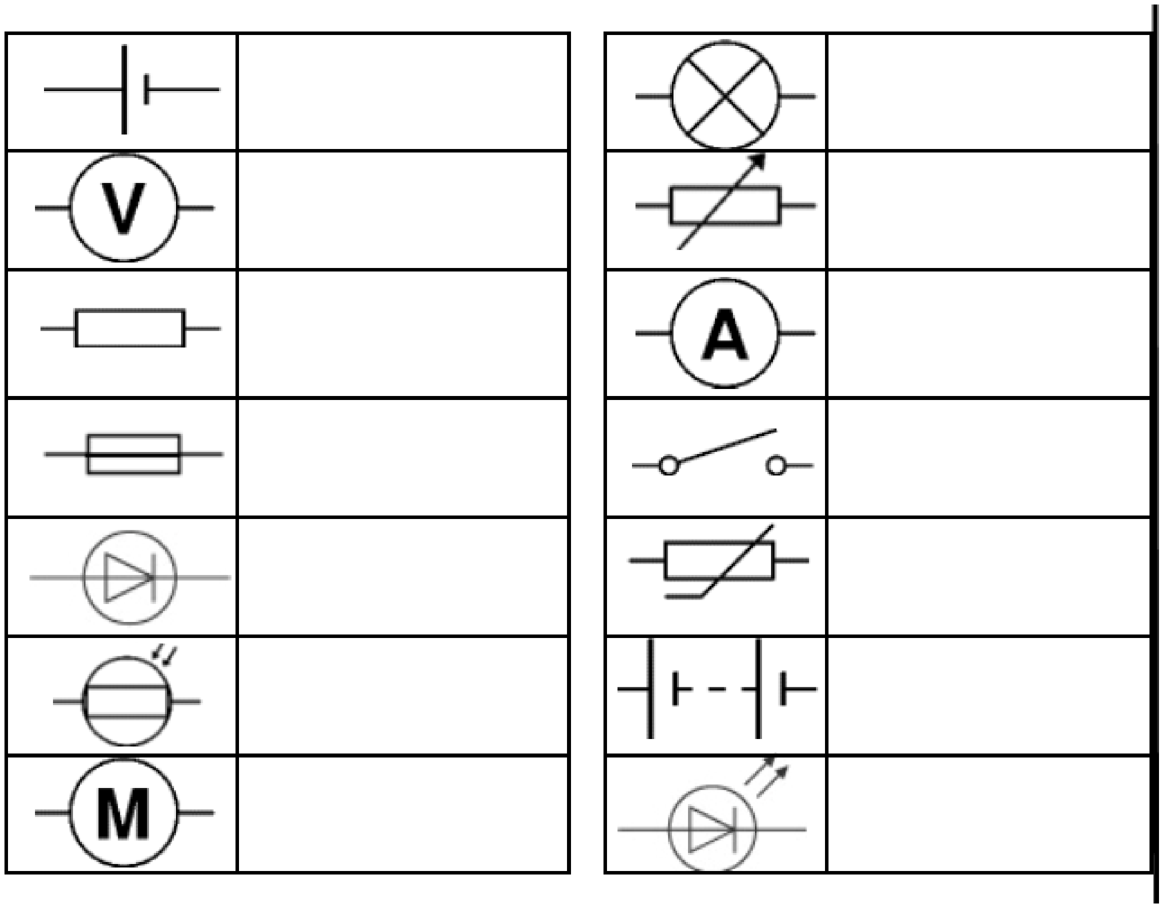
Topic 10 – Electricity and Circuits

1. Describe the structure of the atom.

2. Complete the table to show the mass and charge of protons, neutrons and electrons.

	Relative Mass	Relative Charge
Protons		
Neutrons		
Electrons		

3. Identify the circuit components in the diagrams below



4. In the diagram of a cell, which is the positive and which is the negative terminal?

5. Describe the difference between a series and a parallel circuit.

6. Draw a simple circuit containing a cell, a switch, a lamp, an ammeter and a voltmeter being used to measure the potential difference across the lamp.

7. Explain how a voltmeter should be connected in a circuit.

8. What does a voltmeter measure?

9. What does an ammeter measure?

10. Define **potential difference (voltage)**.

11. Recall the equation, with units, that links charge moved, potential difference (voltage) and energy transferred.

12. Explain how an ammeter should be connected in a circuit.

13. Define the term **electric current**

14. Recall the equation, with units, that links current, time and charge.

15. When a closed circuit includes a source of potential difference what will flow in the circuit?

16. Current is <u>conserved</u> at a junction in a circuit – explain what this means.

17. Changing the resistance in a circuit will also change what other measurement?

18. Explain why changing resistance causes a change in current.

19. Which component can be used to vary the resistance in a circuit?

20. Recall, with units, the equation that links resistance, potential difference and current.

21. If a resistor is added to a circuit in parallel, what is the net effect on the overall resistance?

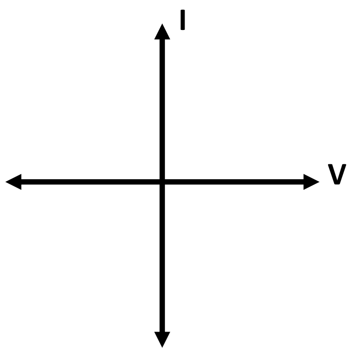
22. Explain why the overall resistance in a circuit decreases if a resistor is added in parallel.

23. If a resistor is added to a circuit in series, what is the net effect on the overall resistance?

24. Explain why the overall resistance in a circuit increases if a resistor is added in series.

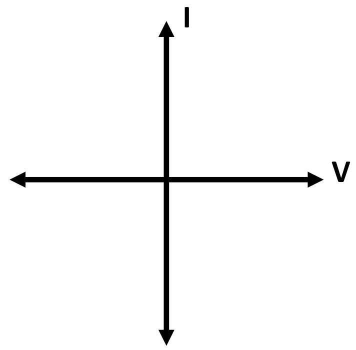
25. Draw a diagram to show a circuit that can be used to investigate the relationship between potential difference, current and resistance for a resistor.

26. Complete the graph below to show how current varies with potential difference for a filament lamp.



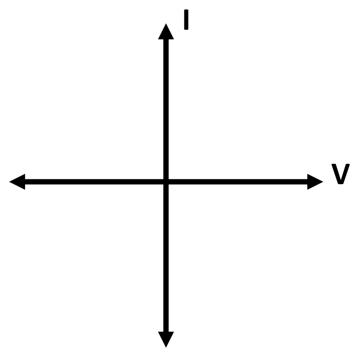
27. Explain the shape of the graph above.

28. Complete the graph below to show how current varies with potential difference for a diode.



29. Explain the shape of the graph above.

30. Complete the graph below to show how current varies with potential difference for a fixed resistor.



31. Explain the shape of the graph above.

32. Describe how the resistance of a light-dependent resistor (LDR) varied with light intensity.

33. Describe how the resistance of a thermistor varies with change of temperature.

34. Explain why an electric current causes a heating effect.

35. [H] Explain ways of reducing unwanted energy transfer through low resistance wires.

36. Describe two advantages of the heating effect of an electric current.

37. Describe two disadvantages of the heating effect of an electric current.

38. Recall the equation, including units, that link current, potential difference and energy transferred.

39. Define the term **power**.

40. What unit is power measured in?

41. Recall the equation, including units, that link power, time taken and energy transferred.

42. The power transfer in any circuit is related to what?

43. Recall the equation, including units, that links current, electrical power, and potential difference.

44. Recall the equation, including units, that links current, electrical power, and resistance.

45. Everyday appliances usually use energy transferred from two types of source. Name these sources.

46. Define direct current and give examples of its use.

47. Define alternating current and give examples of its use.

48. Recall the frequency and voltage of UK domestic a.c. supply.

49. Explain the function of the live input wire in a plug

50. Explain the function of the neutral input wire in a plug

51. Explain the function of an earth wire in a plug

52. Identify the colours of the neutral, live and earth wires.

53. Explain how fuses or circuit breakers are used in making appliances safe.

54. Explain why switches and fuses should be connected in the live wire of a domestic circuit.

55. Recall the potential difference between the live and the neutral mains wires.

56. Recall the potential difference between the live and earth mains wires.

57. Recall the potential difference between the neutral and earth mains wires.

58. Explain the danger of the live wire connecting to the earth wire.

59. What does the power rating of an appliance tell you?

Topic 12 – Magnetism and The Motor Effect

1. Complete the sentence: 'Unlike magnetic poles…….'

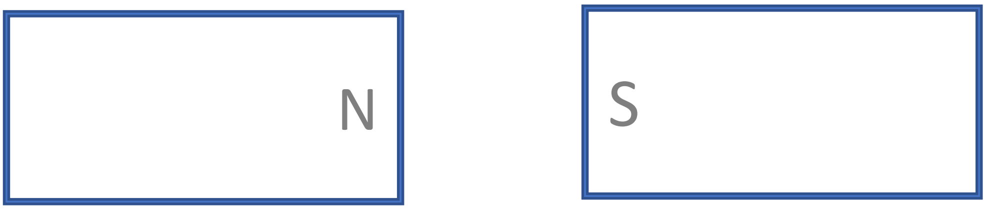
2. Complete the sentence: 'Like magnetic poles…….'

3. Identify four materials that are used is permanent and temporary magnetic materials.

4. Explain the difference between permanent and induced magnets

5. Annotate a diagram of a bar magnet in order to show the shape and direction of the magnetic field around it.

6. Complete the diagram below to show a <u>uniform field</u> between two bar magnets



7. The concentration (how close the magnetic fields lines are to each other) of magnetic field lines tells us what?

8. Describe how you can show the shape and direction of the field of a magnet and the Earth's magnetic field.

9. Explain how we know the core of the Earth must be magnetic

10. Describe how to show that a current can create a magnetic effect

11. Explain how to work out the shape and direction of the magnetic field around a long, straight conductor.

12. The strength of the magnetic field produced around a conductor is dependent on what?

13. A solenoid is an example of a what?

14. Explain what happens when the fields from individual coils inside a solenoid interact.

15. *[H] Apply Newton's third law to the interaction between a current carrying conductor and a magnet.*

16. *[H] Magnetic forces are due to interactions between what?*

17. *[H] Recall Fleming's left-hand rule*

18. *[H] You can use the equation F = B x I x l to find the size of a force. What do these letters represent and what are their units?*

Topic 13 – Electromagnetic Induction

1. *[H] Explain the term electromagnetic induction.*

2. *[H] Identify the factors that affect the size and direction of an induced potential difference.*

3. *[H] In relation to electromagnetic induction, explain the phrase 'the magnetic field produced opposes the original change'*

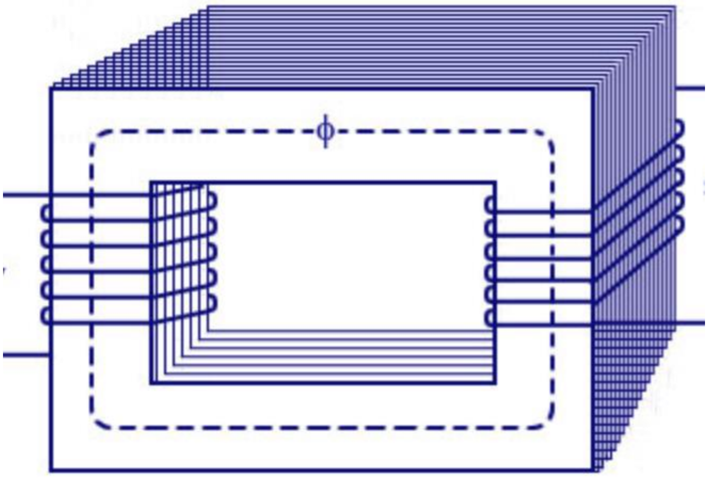
4. *[H] Explain how an alternating current in one circuit is used in a transformer.*

5. *[H] What is a transformer used to change the size of?*

6. Explain what happens in the national gird, referring to the voltages used at each point.

7. Explain where and why step-up and step-down transformers are used in the national grid.

8. Label the primary coil and the secondary coil on this diagram of the transformer.



9. Explain what the following symbols mean in the transformer equation:
   $V_p \times I_p = V_s \times I_s$

Topic 14 – The Particle Model

1. Explain the different states of matter using simple kinetic theory. Make sure you refer to the movement and arrangement of particles.

2. Recall the equation, with units, for calculating density.

3. Core practical: Explain how you would investigate the densities of solids and liquids.

4. Explain why solids and generally denser than liquids and gases

5. Identify the name that describes a change from a solid to a gas

6. Identify the name that describes a change from a solid to a liquid

7. Identify the name that describes a change from a liquid to a gas

8. Identify the name that describes a change from a liquid to a solid

9. Identify the name that describes a change from a gas to a solid

10. Identify the name that describes a change from a gas to a liquid

11. Describe the differences between chemical and physical changes

12. When a substance undergoes a physical change what can you say about the mass before and after?

13. Heating a system may result in which two effects?

14. Explain why heating a system may result in a rise in temperature or a change of state.

15. Define the term **specific heat capacity**

16. Define the term **specific latent heat**

17. When calculating specific heat capacity, you need the following equation. Identify what quantities the symbols represent and the units for each of them.

$$\Delta Q = m \times c \times \Delta\theta$$

18. When calculating specific latent heat, you need the following equation. Identify what quantities the symbols represent and the units for each of them.

$$Q = m \times L$$

19. Explain how to reduce unwanted energy transfer through heating.

20. Describe an experiment that can be done to determine the specific heat capacity of water.

21. Describe a method that you could use to obtain a temperature-time graph for melting ice.

22. Sketch a graph to show the shape of temperature-time graph that you would expect to produce when melting and boiling water. Label the following:
a) The boiling point
b) The melting point
c) The solid phase
d) The liquid phase
e) The gaseous phase

23. Explain why a temperature-time graph remains 'flat' whilst a substance is changing from a liquid to a gas.

24. Explain why a temperature-time graph remains 'flat' whilst a substance is changing from a gas to liquid.

25. Explain what gas pressure is

26. Explain why gas pressure is higher if there are more gas particles in a container.

27. Explain the effect of increasing temperature on pressure.

28. Explain the effect of decreasing temperature on pressure.

29. Describe the term **absolute zero**.

30. What temperature is equivalent to 1 K (1 kelvin)?

31. Explain how to convert from degrees Celsius (^oC) to kelvin (K).

32. Explain how to convert from kelvin (K) to degrees Celsius (^oC).

33. Convert 10^oC to kelvin.

Topic 15 – Forces and Matter

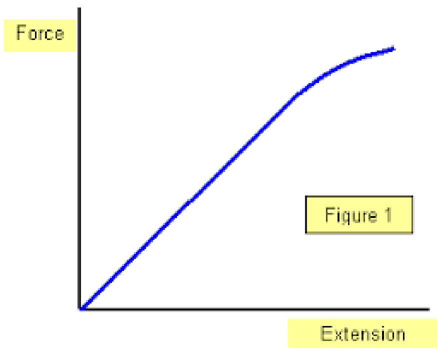
1. When two forces are applied to an object, what are the three possible effects?

2. Explain why two forces are required to make an object stretch, compress or bend.

3. Describe the difference between elastic and inelastic distortion.

4. What does **elastic limit** mean?

5. On the graph below, identify the point at which the object reaches its elastic limit.



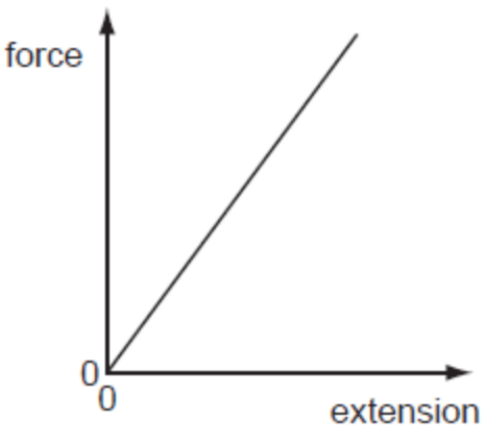
6. When work is done to an object through compressing, bending or stretching which store is energy transferred to?

7. Explain what term **extension** means in relation to a spring.

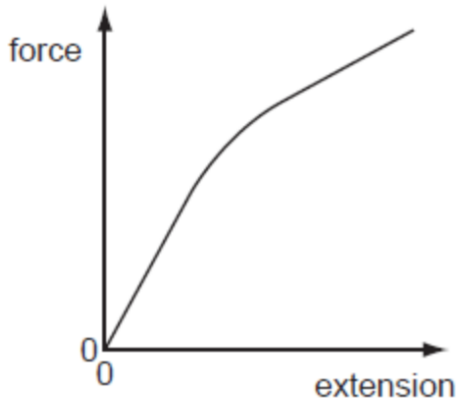
8. Recall the equation, with units, that links force, extension and spring constant.

9. The equation below can be used to calculate work done in stretching a spring. Recall the units for each of the values.
   Energy transferred in stretching = 0.5 x spring constant x extension
   $E = \frac{1}{2} \times k \times x^2$

10. Describe the relationship between force and extension for the graph below.



11. Describe the relationship between force and extension for the graph below.



12. Explain how you can investigate the extension and work done when applying forces to a spring.

Topic 1 - Key Concepts in Physics

1. State the SI base unit for distance. Give it’s name and symbol.
Metre, m

2. State the SI base unit for mass. Give it’s name and symbol.
Kilogram, kg

3. State the SI base unit for time. Give it’s name and symbol.
Second, s

4. State the SI base unit for electric current. Give it’s name and symbol.
Ampere, A

5. State the SI base unit for thermodynamic temperature. Give it’s name and symbol.
Kelvin, K

6. State the SI base unit for amount of substance. Give it’s name and symbol.
Mole, mol

7. State the SI unit for frequency. Give it’s name and symbol.
Hertz, Hz

8. State the SI unit for force. Give it’s name and symbol.
Newton, N

9. State the SI unit for energy. Give it’s name and symbol.
Joule, J

10. 10. State the SI unit for power. Give it’s name and symbol.
Watt, W

11. State the SI unit for pressure. Give it’s name and symbol.
Pascal, Pa

12. State the SI unit for electric charge. Give it’s name and symbol.
Coulomb, C

13. State the SI unit for electric potential difference. Give it’s name and symbol.
Volt, V

14. State the SI unit for electric resistance. Give it’s name and symbol.
Ohm, Ω

15. State the SI unit for magnetic flux density. Give it’s name and symbol.
Tesla, T

16. What does the multiple ‘giga, G’ mean if it is found in front of a unit (for example, gigahertz)
1×10^9

17. What does the multiple 'mega, M' mean if it is found in front of a unit (for example, megahertz)?
1×10^{6}

18. What does the multiple 'kilo, k' mean if it is found in front of a unit (for example, kilohertz)?
1×10^{3}

19. What does the sub-multiple 'centi, c' mean if it is found in front of an SI unit (for example, centimetre)?
1×10^{-2}

20. What does the sub- multiple 'milli, m' mean if it is found in front of an SI unit (for example, millimetre)?
1×10^{-3}

21. What does the sub- multiple 'micro, μ' mean if it is found in front of an SI unit (for example, micrometre)?
1×10^{-6}

22. What does the multiple 'nano, n' mean if it is found in front of an SI unit (for example, nanometre)?
1×10^{-9}

23. How do you convert time from hours to seconds?
Multiply (x) by 60 (to give minutes) and then multiply (x) by 60 again.

24. How do you convert time from seconds to hours?
Divide (÷) by 60 (to give minutes) and then divide (÷) by 60 again.

25. Write the following numbers to 2 significant figures:
34.2
4.16
0.00572
4510
34
4.2
0.0057
4500

(If you don't understand why these are the answers, please ask your teacher for more help on <u>significant figures</u>)

26. Write the following numbers in standard form:
57,890
0.0034
23
4,000,000
5.7890×10^{4}
3.4×10^{-3}
2.3×10^{1}
4×10^{6}

(If you don't understand why these are the answers, please ask your teacher for more help on <u>standard form</u>)

Topic 8 – Energy – Forces Doing Work

1. Identify eight types of energy store
   Kinetic
   Thermal
   Gravitational potential
   Chemical
   Elastic potential
   Electrostatic
   Magnetic
   Nuclear

2. Identify four types of energy transfer
   Mechanical (by force)
   Electrically
   Heating
   Radiation

3. What can be said about the net change of energy in a closed system if energy transfers take place within it?
   There is no net change when energy transfers take place within a closed system.

4. Identify three different ways in which the energy of a system can be changed
   1. Through work done by forces
   2. In electrical equipment
   3. In heating

5. Give an example of energy being transferred by heating
   When a fuel is burnt to heat water the chemical store of the fuel is transferred to the thermal store of the water by heating.

6. Give an example of energy being transferred by forces doing work
   If a crane lifts up a box, work is done against gravity. This causes energy to be transferred to the box's kinetic and gravitational potential energy stores.

7. Give an example of energy being transferred by electrical equipment
   In a remote-control car, energy is transferred electrically from the chemical store of the battery to the kinetic store of the car's wheels.

8. Energy transfer is measured using which unit?
   Joules (J)

9. Work done is measured using which unit?
   Joules (J)

10. Write an equation to show the relationship between energy transferred and work done.
    Energy transferred (J) = Work done (J)

11. Describe how to measure the work done by a force
To calculate work done by a force you would need to measure the distance over which the force has acted.

12. Recall the equation, with units, that links force, distance and work done.
Work done (J) = Force (N) x Distance moved (m)
E = F x d

13. Recall the equation, with units, for calculating a change in gravitational potential energy.
Change in gravitational potential energy (J) = mass (kg) x gravitational field strength (N/kg) x change in vertical height (m)
ΔGPE = m x g x Δh

14. Recall the equation, with units, for calculating kinetic energy.
Kinetic energy (J) = ½ x mass (kg) x $(\text{speed})^2$ (m/s)
KE = ½ x m x v^2

15. In all systems energy is **dissipated.** Explain what this means.
In all energy transfers some energy is always stored in less useful ways. This energy is dissipated.

16. Explain why mechanical processes become wasteful.
They cause a rise in temperature so dissipate energy in heating the surroundings.

17. Define the term **power.**
The rate at which energy is transferred.

18. Recall the equation, with units, that links work done, time taken and power.
Power (W) = work done (J) / time taken (s)

$$P = \frac{E}{t}$$

19. One watt is equal to what?
One joule per second (1 W = 1 J/s)

20. Recall the equation for calculating efficiency

$$Efficiency = \frac{(useful\ energy\ transferred)}{(total\ energy\ supplied)}$$

Topic 9 – Forces and their effects

1. Name three types of fields that can act at distance on an object (these are known as non-contact forces).
   Gravitational
   Electrostatic
   Magnetic

2. Name two types of forces that act by contact
   Normal contact force
   Friction

3. Explain the term **interaction pair**.
   When two objects interact both objects feel equal and opposite forces. These can be represented on a diagram using vectors (arrows).

4. Explain the difference between vector and scalar quantities
   Scalar quantities have only a size (magnitude) whereas vector quantities have a size and a direction.

5. *[H] Identify the features of a free body force diagram*
   - **It shows all the forces acting on a single object (an isolated body)**
   - **It doesn't include any forces that the body exerts of the rest of the world**
   - **The arrows are drawn from the centre of the body and directed away from it**
   - **The size of the arrows shows the relative magnitude of the forces**
   - **The direction of the arrows show the directions of the forces**

6. *[H] Describe what is meant by the term 'net force' on a free body diagram*
   The net force shows the overall effect of all of the forces acting on an object added together.

7. *[H] If an object is described as in **equilibrium**, what does this mean?*
   This means that there is no net force (no resultant force) which would result in an object being either stationary (not moving) or moving at a constant velocity.

8. Explain how unwanted energy transfers can be reduced through lubrication.
   Lubrication reduces the friction between two moving objects. This means that less non-useful energy is transferred (dissipated) through heating to the surroundings.

****** If you are studying the higher tier then you will also need to know how to draw free body diagrams and resolve a force. Your teacher should give you extra practice on this ******

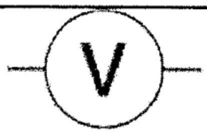
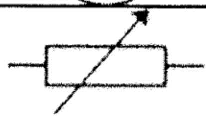
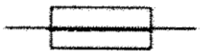
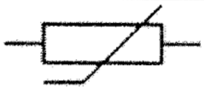
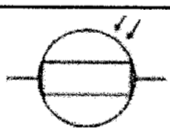
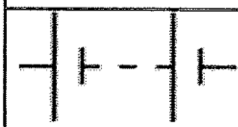
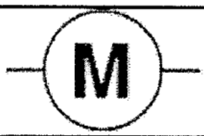
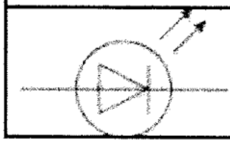
Topic 10 – Electricity and Circuits

1. Describe the structure of the atom.
   The atom is formed of a central nucleus containing protons and neutrons. Surrounding the nucleus are shells of electrons.

2. Complete the table to show the mass and charge of protons, neutrons and electrons.

	Relative Mass	Relative Charge
Protons	**1**	**+1**
Neutrons	**1**	**0**
Electrons	**1/2000**	**-1**

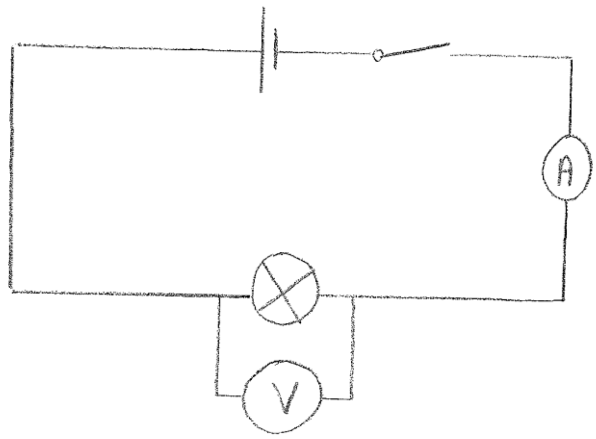
3. Identify the circuit components in the diagrams below

	Cell		Lamp
	Voltmeter		Variable resistor
	Fixed resistor		Ammeter
	Fuse		Open switch
	Diode		Thermistor
	Light-dependent resistor (L.D.R)		Battery
	Motor		Light-emitting diode (L.E.D.)

4. In the diagram of a cell, which is the positive and which is the negative terminal?
   The positive terminal in represented by the longer line, the shorted line is the negative terminal.

5. Describe the difference between a series and a parallel circuit.
   A series circuit only has one 'pathway' around it. A parallel circuit contains branches with <u>at least</u> two 'pathways' around it.

6. Draw a simple circuit containing a cell, a switch, a lamp, an ammeter and a voltmeter being used to measure the potential difference across the lamp.



7. Explain how a voltmeter should be connected in a circuit.
A voltmeter should be placed <u>in parallel</u> with the component that it is measuring the potential difference of.

8. What does a voltmeter measure?
Potential difference, measured in volts.

9. What does an ammeter measure?
Current, measured in amps or amperes.

10. Define **potential difference (voltage)**.
It is the energy transferred per unit of charge. One volt is equal to a joule per coulomb.

11. Recall the equation, with units, that links charge moved, potential difference (voltage) and energy transferred.
Energy transferred (joule, J) = charge moved (coulomb, C) x potential difference (volt, V)
E = Q x V

12. Explain how an ammeter should be connected in a circuit.
An ammeter should be placed <u>in series</u>.

13. Define the term **electric current**
Current is the rate of flow of charge. The current in metals in a flow of electrons.

14. Recall the equation, with units, that links current, time and charge.
Charge (coulomb, C) = current (ampere, A) x time (second, s)
Q = I x t

15. When a closed circuit includes a source of potential difference what will flow in the circuit?
A current

16. Current is <u>conserved</u> at a junction in a circuit – explain what this means.
In a circuit the total amount of current stays the same on its journey around the circuit. At a junction in a parallel circuit, the current splits to travel along different branches but the total amount entering the junction is the same as the total amount leaving.

17. Changing the resistance in a circuit will also change what other measurement?
The current

18. Explain why changing resistance causes a change in current.
As resistance increases or decreases it becomes more or less easy for the current to flow around the circuit. This is because when resistance is higher, there are more collisions between the flowing electrons and the positive metal ions in the wire making it harder for them to flow meaning current is lower.

19. Which component can be used to vary the resistance in a circuit?
A variable resistor.

20. Recall, with units, the equation that links resistance, potential difference and current.
Potential difference (volt, V) = current (ampere, A) x resistance (ohm, Ω)
V = I x R

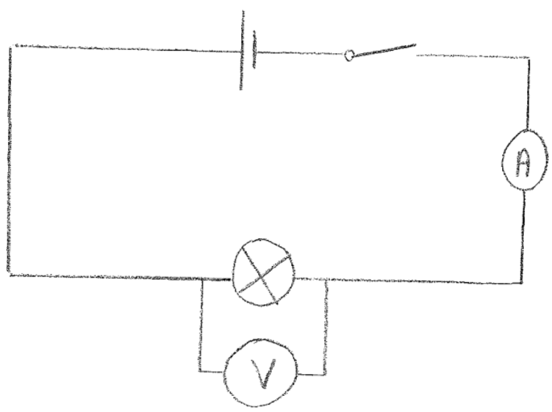
21. If a resistor is added to a circuit in parallel, what is the net effect on the overall resistance?
It is decreased

22. Explain why the overall resistance in a circuit decreases if a resistor is added in parallel.
- **In parallel, both resistors have the same potential difference across them.**
- **By adding another loop, the current has more than one direction to go in.**
- **This increases the total current that can flow around the circuit.**
- **Using V = I x R we can then see that an increase in current means a decrease in the total resistance of the circuit.**

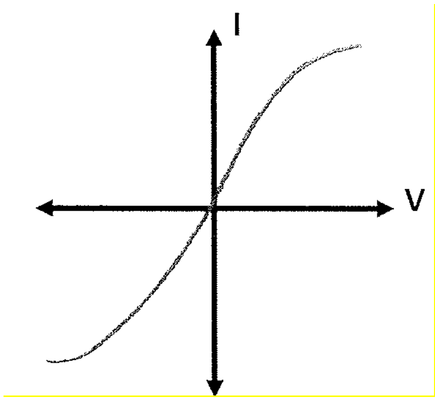
23. If a resistor is added to a circuit in series, what is the net effect on the overall resistance?
It is increased

24. Explain why the overall resistance in a circuit increases if a resistor is added in series.
- **In a series circuit the total resistance of two components is the sum of their resistance.**
- **By adding a resistor in series the two resistors share the potential difference.**
- **This reduces the total current in the circuit.**
- **This means the total resistance of the circuit increases.**

25. Draw a diagram to show a circuit that can be used to investigate the relationship between potential difference, current and resistance for a resistor.

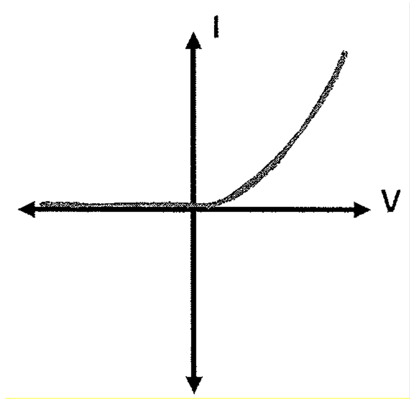


26. Complete the graph below to show how current varies with potential difference for a filament lamp



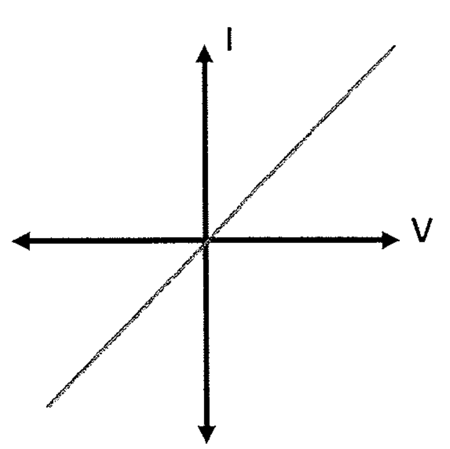
27. Explain the shape of the graph above.
When a current flows through a filament lamp, energy is transferred to the thermal store of the filament. Resistance increases as the temperature increases so eventually less current can flow per unit of potential difference. This means that the line becomes curved at levels of high current.

28. Complete the graph below to show how current varies with potential difference for a diode.



29. Explain the shape of the graph above.
A diode only allows current through in one direction. This is because the resistance in the other direction is too high to let current flow.

30. Complete the graph below to show how current varies with potential difference for a fixed resistor.



31. Explain the shape of the graph above.
The current through a fixed resistor (a lamp) is directly proportional to potential difference. This results in a linear graph through the origin.

32. Describe how the resistance of a light-dependent resistor (LDR) varied with light intensity.
As light intensity increases, the resistance of an LDR decreases.

33. Describe how the resistance of a thermistor varies with change of temperature.
As temperature increases, the resistance of a thermistor decreases.

34. Explain why an electric current causes a heating effect.
When there is an electric current in a resistor it does work against resistance. This is because are collisions between electrons and the positive metal ions in a resistor. The causes energy to be transferred to the thermal store of the component and the thermal store of the surroundings.

35. [H] Explain ways of reducing unwanted energy transfer through low resistance wires.
Low-resistance wires mean that fewer collisions take place between electrons and positive metal ions in the lattice. Fewer collisions cause there to be less energy transferred to the thermal store of the component/wires and the surroundings.

36. Describe two advantages of the heating effect of an electric current.

<u>In appliances that heat food</u>

For example, in a toaster there is a coil of wire that has a very high resistance. When a current flows through the wire energy is transferred by heating to the bread which then cooks.

<u>In fuses</u>

If a current gets too high in circuit that has a fuse fitted, then the heating effect of the current causes the fuse to melt. This breaks the circuit and can prevent fires and electric shocks.

37. Describe two disadvantages of the heating effect of an electric current.

<u>Problems with efficiency</u>

The heating effect of a current often means that less energy is transferred to useful stores as it is instead transferred to the thermal store of the appliance and the surroundings.

<u>Broken appliances</u>

If circuits become too hot, then this can cause components to melt and break the circuit. This means that the appliance may break or not work correctly anymore.

38. Recall the equation, including units, that link current, potential difference and energy transferred.

energy transferred (joule, J) = current (ampere, A) x potential difference (volt, V) x time (second, s)

39. Define the term **power**.

The energy transferred per second.

40. What unit is power measured in?

Watts

41. Recall the equation, including units, that link power, time taken and energy transferred.

power (watt, W) = energy transferred (joule, K) / time taken (second, s)

$P = E/t$

42. The power transfer in any circuit is related to what?

The potential difference across it and the current in it.

43. Recall the equation, including units, that links current, electrical power, and potential difference.

electrical power (watt, W) = current (ampere, A) x potential difference (volt, V)

$P = I \times V$

44. Recall the equation, including units, that links current, electrical power, and resistance.

electrical power (watt, W) = current (ampere^2, A^2) x resistance (ohm, Ω)

$P = I^2 \times R$

45. Everyday appliances usually use energy transferred from two types of source. Name these sources.

Batteries (using direct current, d.c.) and mains supply (alternating current, a.c.)

46. Define direct current and give examples of its use.
Direct current is movement of charge in one direction only. Batteries and cells supply direct current (e.g. in TV remotes and in mobile phones)

47. Define alternating current and give examples of its use.
Alternating current is the movement of charge that changes direction. It is used in mains supply electricity to power appliances such as kettles and toasters.

48. Recall the frequency and voltage of UK domestic a.c. supply.
Frequency = 50Hz
Voltage = 230 V

49. Explain the function of the live input wire in a plug
The live wire carries the voltage (potential difference) and around 230 V.

50. Explain the function of the neutral input wire in a plug
The neutral wire completes the circuit. Electricity flow in through the live wire and out through the neutral wire. It is always at 0 V.

51. Explain the function of an earth wire in a plug
The earth wire is for safety and protects the wiring. It carries the current away if something goes wrong (for example, if the live wire touches the metal casing of an appliance) and stops the appliance casing becoming live. It is always at 0 V.

52. Identify the colours of the neutral, live and earth wires.
Neutral = blue
Live = brown
Earth = green and yellow

53. Explain how fuses or circuit breakers are used in making appliances safe.
- **If there is a dangerous surge in current that is higher than the fuse rating, then the wire in the fuse will melt.**
- **The fuse is connected to the live wire, so breaking the fuse breaks the circuit and cuts off the live supply.**
- **This isolates the whole appliance making it impossible to get an electric shock from the case.**
- **It also prevents the risk of fire.**
- **Circuit breakers work in a similar way to fuses but rather than melt they switch off or 'trip'.**

54. Explain why switches and fuses should be connected in the live wire of a domestic circuit.
- **Switches are used so that the circuit can be broken.**
- **The switch is connected to the live wire and if there is a problem it can be used to stop the current flow in the circuit.**
- **This means the appliance becomes isolated and the risk of electric shock is lower.**
- **Fuses are connected to the live wire so they can also stop the current from flowing if it becomes dangerously high.**
- **This means the appliance becomes isolated and the risk of electric shock is lower.**

55. Recall the potential difference between the live and the neutral mains wires.
Equal to the supply voltage (usually 230 V)

56. Recall the potential difference between the live and earth mains wires.
230 V

57. Recall the potential difference between the neutral and earth mains wires.
0 V

58. Explain the danger of the live wire connecting to the earth wire.
If the live wire connects to the earth wire there will be a low resistance path for current to flow through. The low resistance means that the current will be very high which means that a fire could start.

59. What does the power rating of an appliance tell you?
The maximum safe power they can operate at. It tells you the maximum amount of energy transferred between stores per second.

Topic 12 – Magnetism and The Motor Effect

1. Complete the sentence: 'Unlike magnetic poles…….'
   Attract

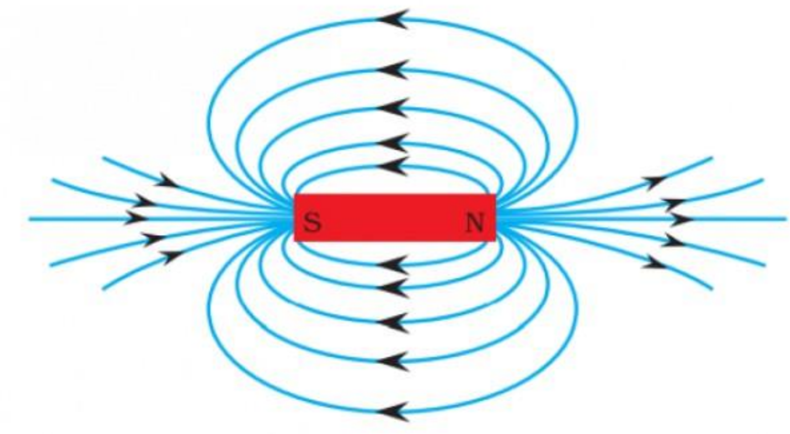
2. Complete the sentence: 'Like magnetic poles…….'
   Repel

3. Identify four materials that are used is permanent and temporary magnetic materials.
   Cobalt, steel, iron and nickel

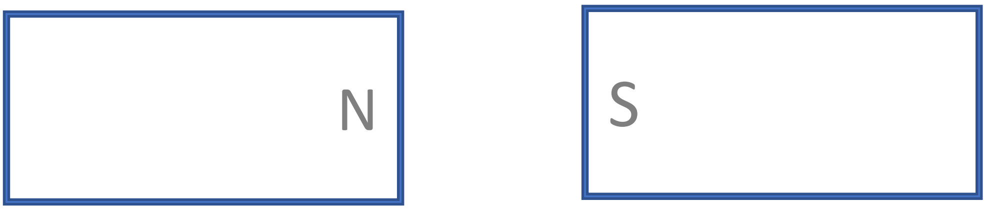
4. Explain the difference between permanent and induced magnets
   Permanent magnets produce their own magnetic field <u>all of the time</u>.
   Induced magnets <u>only produce a magnetic field while they are in another magnetic field</u>.

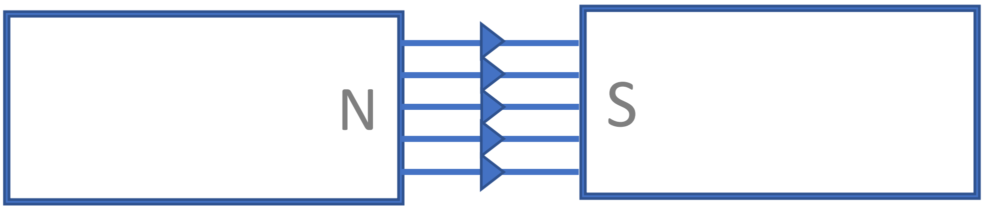
5. Annotate a diagram of a bar magnet in order to show the shape and direction of the magnetic field around it.

Answer:



6. Complete the diagram below to show a <u>uniform field</u> between two bar magnets





7. The concentration (how close the magnetic fields lines are to each other) of magnetic field lines tells us what?
How strong the magnetic field is. The closer the lines the stronger the field.

8. Describe how you can show the shape and direction of the field of a magnet and the Earth's magnetic field.
- **You can use plotting compasses**
- **Inside the plotting compass is a small bar magnet called a needle**
- **The needle lines up with the magnetic field that it is in**
- **Place the magnet on a piece of paper and place the plotting compass near the magnet**
- **Mark the direction of the compass needle for drawing two dots – one at each end of the needle**
- **Remove the plotting compass and draw an arrow between the two dots (from north to south)**
- **Repeat this at different points around the magnet**
- **This can also be done with a compass at any point on Earth. The needle will always point towards the Earth's North Pole.**

9. Explain how we know the core of the Earth must be magnetic
If you use a compass anywhere on Earth the needle on the compass will always point towards the Earth's North Pole (this is actually the magnetic south pole).

10. Describe how to show that a current can create a magnetic effect
Pass a current through a wire. A plotting compass can then be used to show that there is a magnetic field around the wire.

11. Explain how to work out the shape and direction of the magnetic field around a long, straight conductor.
Use the right-hand thumb rule; the thumb is the direction of the current and the direction that the fingers point in is the direction of the magnetic field.

12. The strength of the magnetic field produced around a conductor is dependent on what?
The size of the current and the distance from the conductor.

13. A solenoid is an example of a what?
An electromagnet

14. Explain what happens when the fields from individual coils inside a solenoid interact.
In the centre of the solenoid the fields add together of form a strong, almost uniform magnetic field.
Around the outside of the solenoid the overlapping field lines cancel each other out to give a weaker magnetic field.

15. *[H] Apply Newton's third law to the interaction between a current carrying conductor and a magnet.*
    A current carrying conductor placed near a magnet experiences a force and an equal and opposite force acts on the magnet.

16. *[H] Magnetic forces are due to interactions between what?*
    Different magnetic fields

17. *[H] Recall Fleming's left-hand rule*
    Using your left hand:
    Thumb = Motion
    First Finger = Field direction
    Second Finger = Current

18. *[H] You can use the equation F = B x I x l to find the size of a force. What do these letters represent and what are their units?*
    F = Force measured in Newtons (N)
    B = Magnetic flux density in tesla (T) <u>or</u> Newton per amps metres (N/Am)
    I = Current measured in amps (A)
    l = Length measured in metres (m)

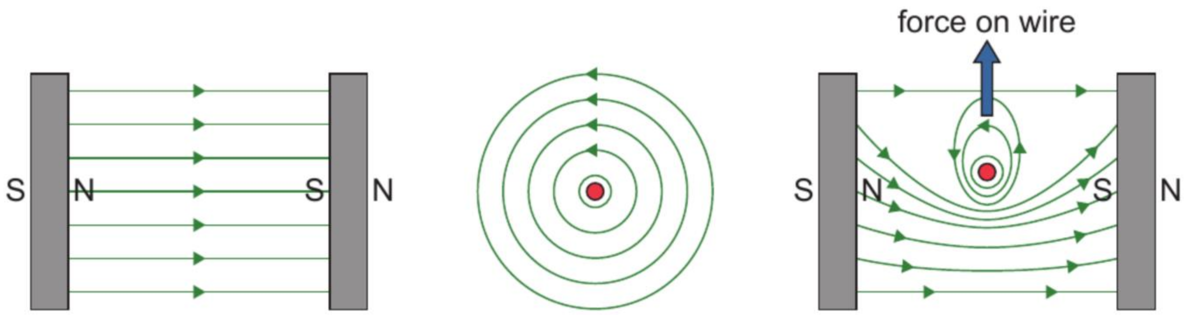
Topic 13 – Electromagnetic Induction

1. *[H] Explain the term electromagnetic induction.*
   Electromagnetic induction is the process in which a potential difference is induced (created) in a wire where there is a changing magnetic field.

2. *Identify the factors that affect the size and direction of an induced potential difference.*
   <u>SIZE</u>
   Changing the strength of the magnetic field
   Increasing the speed of movement/change of field
   Increasing the number of turns per unit length of coils in a wire

   <u>DIRECTION</u>
   Moving or rotating the magnet or conductor in the opposite direction
   Reversing the polarity of the magnet

3. *[H] In relation to electromagnetic induction, explain the phrase 'the magnetic field produced opposes the original change'*
   - **A wire carrying a current can experience a force near a magnetic field.**
   - **The force occurs because the magnetic field produced around the wire interacts with the magnetic between the magnets.**
   - **Providing the two magnetic fields are not in the same direction, the wire will experience an equal and opposite force and will move.**



Two flat magnets produce a uniform magnetic field between them.

A magnetic field goes around a wire carrying a current.

When the wire carrying a current is put between the magnets, the two fields interact to produce a force.

4. *[H] Explain how an alternating current in one circuit is used in a transformer.*

- **Transformers work using two circuits with coils of wire from each wrapped around an iron core which is easily magnetised.**
- **When an alternating current (or p.d.) is applied to the first circuit this produces an alternating magnetic field.**
- **The iron core then experiences an alternating magnetism.**
- **This alternating magnetism induces an alternating current (or p.d.) in the secondary coil.**

5. *[H] What is a transformer used to change the size of?*
An alternating voltage

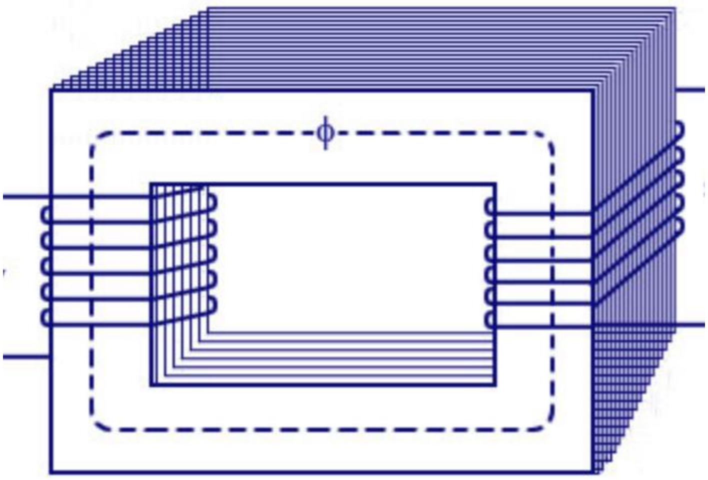
6. Explain what happens in the national gird, referring to the voltages used at each point.

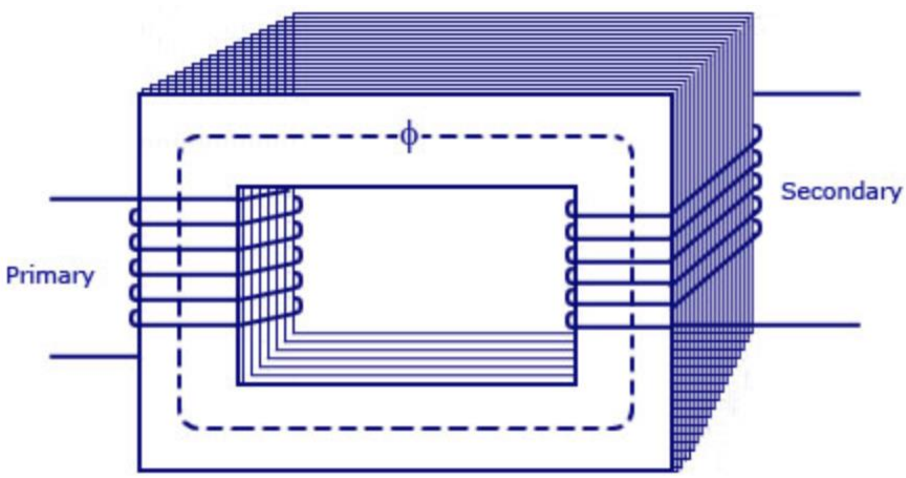
- **In the national grid, electrical energy is transferred at high voltages from power stations. It is transferred at high voltages because it improves the efficiency of the transfer by reducing heat loss in transmission lines.**
- **The electricity is then transferred at lower voltages in each locality for domestic uses (e.g. for houses)**

7. Explain where and why step-up and step-down transformers are used in the national grid.
Step-up transformers
These are used in the power station to increase the voltage and keep current low.

Step down transformers
These are used to reduce the voltage and increase current before the electricity is transferred to peoples' homes.

8. Label the primary coil and the secondary coil on this diagram of the transformer.





9. Explain what the following symbols mean in the transformer equation:

$V_p \times I_p = V_s \times I_s$

V_p = The potential difference (voltage) across the primary coil
I_p = The current through the primary coil

V_s = The potential difference (voltage) across the secondary coil
I_s = The current through the primary coil

Topic 14 – The Particle Model

1. Explain the different states of matter using simple kinetic theory. Make sure you refer to the movement and arrangement of particles.
Solids
The particles are very closed together in fixed positions
The particles have little energy so only vibrate around fixed positions
There are strong forces of attraction between the particles

Liquids
The particles are close together in irregular arrangements
The particles have some energy so can move past each other randomly but slowly
The forces of attraction are weaker than in a solid

Gases
The particles are spread out from each other
They have lots of energy so move quickly and at random
There are almost no forces of attraction between the particles

2. Recall the equation, with units, for calculating density.
Density (kg/m^3) = mass (kg) / volume (m^3)
$$\boldsymbol{\rho = \frac{m}{V}}$$

3. Core practical: Explain how you would investigate the densities of solids and liquids.
Liquids
- **Place a beaker on a mass balance and 'zero' the reading**
- **Then add a known volume of the liquid to the beaker**
- **Take the mass reading of the known volume and then calculate density using density = mass / volume**

Solids
- **Measure the mass of the solid using a mass balance.**
- **Then set up a displacement can filled with water and a measuring cylinder next to it.**
- **Drop the solid into the displacement can and collect the displaced water it the measuring cylinder.**
- **The volume of water displaced is equal to the volume of the solid.**
- **Use the equation density = mass / volume to calculate the density of the solid**

4. Explain why solids and generally denser than liquids and gases
Solids contain particles that are closer together so there is more mass per volume.

5. Identify the name that describes a change from a solid to a gas
Sublimation

6. Identify the name that describes a change from a solid to a liquid
Melting

7. Identify the name that describes a change from a liquid to a gas
Evaporating

8. Identify the name that describes a change from a liquid to a solid
Freezing

9. Identify the name that describes a change from a gas to a solid
Deposition

10. Identify the name that describes a change from a gas to a liquid
Condensing

11. Describe the differences between chemical and physical changes
Physical changes can be reversed so that the material returns to its original properties. Physical changes do not create new substances. Chemical changes cannot be reversed in the same way and make new substances.

12. When a substance undergoes a physical change what can you say about the mass before and after?
It remains the same (mass is conserved)

13. Heating a system may result in which two effects?
- **A rise in temperature**
- **A change of state**

14. Explain why heating a system may result in a rise in temperature or a change of state.
Heating a system increases the energy in that system. The particles' potential and kinetic energy stores increase. As the particles store more energy this either leads to a change in temperature (an observation that measures the kinetic store of a substance) or the breaking of forces of attraction between the particles in order to change state (an increase in potential store).

15. Define the term **specific heat capacity**
Specific heat capacity is a measure of how much energy is required to heat 1kg of a substance by 1°C.

16. Define the term **specific latent heat**
Specific latent heat is a measure of how much energy is required to change 1kg of a substance from one state in to another (e.g. from a solid to a liquid).

17. When calculating specific heat capacity, you need the following equation. Identify what quantities the symbols represent and the units for each of them.

$$\Delta Q = m \times c \times \Delta\theta$$

ΔQ = change in thermal <u>energy</u> (J)
m = mass (kg)
c = specific heat capacity (J/kg °C)
Δθ = temperature change (°C) (the symbol is 'theta)

18. When calculating specific latent heat, you need the following equation. Identify what quantities the symbols represent and the units for each of them.

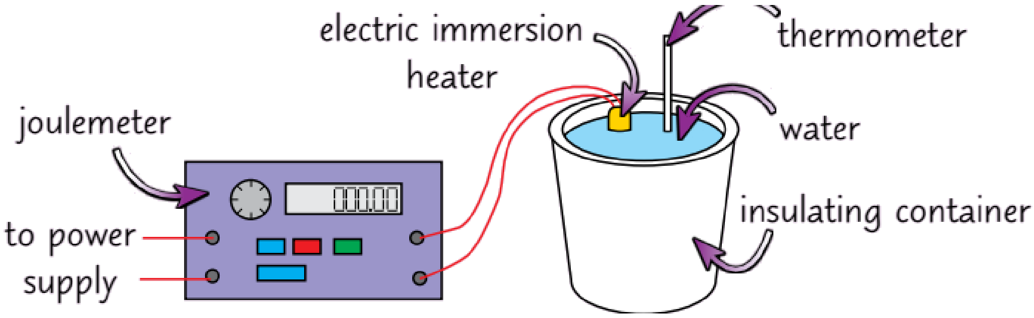
$$Q = m \times L$$

Q = thermal energy (J)
m = mass (kg)
L = specific latent heat (J/kg)

19. Explain how to reduce unwanted energy transfer through heating.
You should use thermal <u>insulation</u>. Insulators are poor conductors of heat so will reduce the rate of heat transfer from a away from a store of thermal energy.

20. Describe an experiment that can be done to determine the specific heat capacity of water.
You will need the following equipment:

- **A mass balance**
- **An insulted beaker**
- **An immersion heater connected to a joulemeter**
- **A power supply**
- **A thermometer**



Method

- **Place the beaker on the mass balance and 'zero' it.**
- **Fill the beaker with water and record the mass**
- **Measure and record the starting temperature of the water**
- **Turn on the power supply connected to the joulemeter**
- **Heat the water until it has increased in temperature by around 10°C**
- **Stop the experiment and record the reading on the joulemeter**

21. Describe a method that you could use to obtain a temperature-time graph for melting ice.
You need the following equipment:

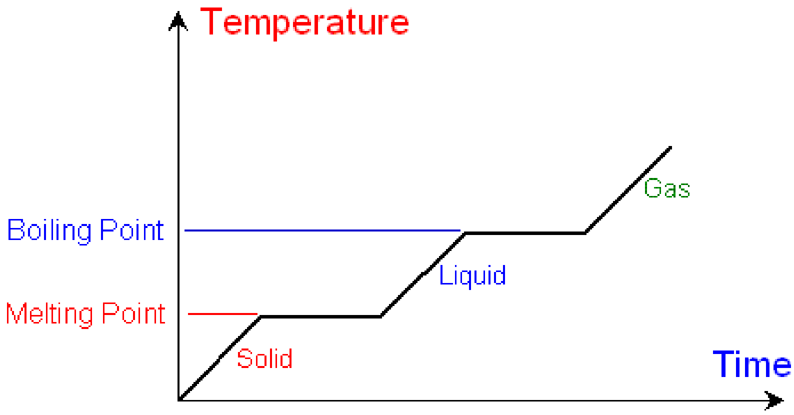
- **A beaker**
- **Crushed ice**
- **Thermometer**
- **Bunsen burner**
- **Tripod gauze**

Method

- **Fill the beaker with crushed ice.**
- **Use the thermometer to measure the temperature of the ice in the beaker and record it.**
- **Place the beaker on a tripod and gauze and use the Bunsen burner to heat it.**
- **At equal intervals record the changing temperature of the ice (e.g. every 10 seconds).**
- **Continue to take measurements until the water has boiled.**
- **Plot a graph of the results.**

22. Sketch a graph to show the shape of temperature-time graph that you would expect to produce when melting and boiling water. Label the following:

f) The boiling point
g) The melting point
h) The solid phase
i) The liquid phase
j) The gaseous phase



23. Explain why a temperature-time graph remains 'flat' whilst a substance is changing from a liquid to a gas.
When a substance is changing state the energy it is receiving from the heat source is used to overcome the bonds between particles rather than being transferred to the substances kinetic and thermal store. This means that the temperature remains constant until all of the bonds between particles have been overcome and the substance changes state.

24. Explain why a temperature-time graph remains 'flat' whilst a substance is changing from a gas to liquid.
When a substance is changing state from gas to liquid there are bonds forming between particles. The formation of bonds releases energy which means that the temperature remains stable and doesn't drop until all bonds have been formed and then the temperature will continue to drop.

25. Explain what gas pressure is
Gas particles move quickly and at random, when they collide with an object they exert a force on it. Gas pressure is a measure of the force acting per unit area of on object.

26. Explain why gas pressure is higher if there are more gas particles in a container.
More gas particles in a set volume means that they will collide more often with the walls of the container. This means they exert more force per unit area meaning the pressure is higher.

27. Explain the effect of increasing temperature on pressure.
Pressure increases as temperature increases. The reason for this is that, as the particles are heated, the kinetic energy store of the particles increases and they move faster. This means they collide with the container more often and with more energy which gives a higher pressure.

28. Explain the effect of decreasing temperature on pressure.
Pressure decreases as temperature decreases. The reason for this is that, as the particles are cooled, the kinetic energy store of the particles decreases and they move more slowly. This means they collide with the container less often and with less energy which gives a lower pressure.

29. Describe the term **absolute zero**.
Absolute zero is -273^{o}C. It is the temperature at which particles have as little energy as is possible.

30. What temperature is equivalent to 1 K (1 kelvin)?
-273^{o}C

31. Explain how to convert from degrees Celsius (^{o}C) to kelvin (K).
Add 273 to the degrees Celsius value.

32. Explain how to convert from kelvin (K) to degrees Celsius (^{o}C).
Subtract 273 to the kelvin value.

33. Convert 10^{o}C to kelvin.
283 K

Topic 15 – Forces and Matter

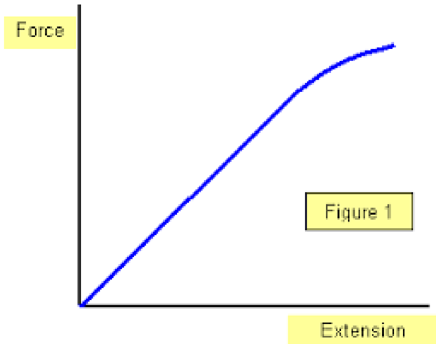
1. When two forces are applied to an object, what are the three possible effects?
   The object may stretch, compress (be squashed) or bend

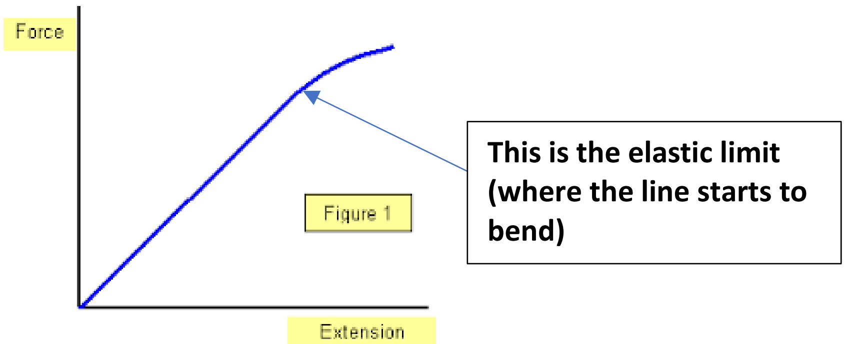
2. Explain why two forces are required to make an object stretch, compress or bend.
   Two forces are required to stop to object simply moving rather than changing shape.

3. Describe the difference between elastic and inelastic distortion.
   Elastic distortion takes place when an object can return to its original <u>shape and length</u> after having forces applied to it. Inelastic distortion takes place when an object doesn't return to its original <u>shape and length</u> after having forces applied to it.

4. What does **elastic limit** mean?
   The elastic limit is a point at which an object doesn't distort elastically and begins to distort inelastically.

5. On the graph below, identify the point at which the object reaches its elastic limit.





6. When work is done to an object through compressing, bending or stretching which store is energy transferred to?
   Energy is transferred to the elastic potential store of the object. If the object is elastic then all of the work done is transferred to the object's elastic potential energy store.

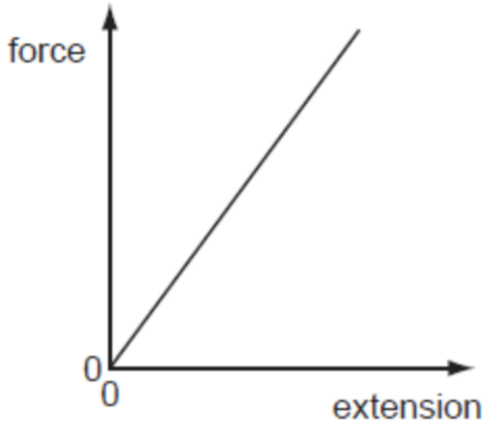
7. Explain what term **extension** means in relation to a spring.
   The extension is the <u>change in length</u> of a spring when forces are applied.

8. Recall the equation, with units, that links force, extension and spring constant.
Force exerted on a spring (newton, N) = spring constant (newton per metre, N/m) x extension (metre, m)
$\boldsymbol{F = k \times x}$

9. The equation below can be used to calculate work done in stretching a spring. Recall the units for each of the values.
Energy transferred in stretching = 0.5 x spring constant x extension
$E = \frac{1}{2} \times k \times x^2$

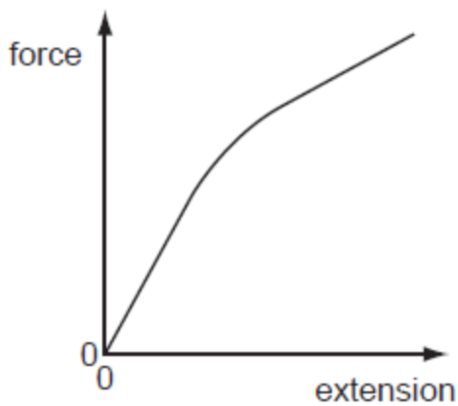
E = energy transferred (joule, J)
k = spring constant (newton per metre, N/m)
x^2 = extension (metre, m)^2

10. Describe the relationship between force and extension for the graph below.



The relationship between force and extension is directly proportional (and linear). ***(You can tell this because the graph is a straight line through the origin.)***

11. Describe the relationship between force and extension for the graph below.



The relationship starts as linear and directly proportional but then becomes non-linear (and non-proportional). This happens when the graph line begins to bend.

12. Explain how you can investigate the extension and work done when applying forces to a spring.

Equipment:

- **Clamp and stand**
- **A millimetre ruler**
- **A spring**
- **A hanging mass with extra masses**

Method:

- **Set up the equipment so that the rule is able to measure the extension of the spring.**
- **Add masses one at a time and record the mass along with the extension (change in length) of the spring**
- **Repeat this until you have used all of the masses**
- **Plot a force-extension graph of your results. The force applied by each mass can be calculated using W = m x g.**